
Network Alternate Route Selection

The Network Alternate Route Selection (NARS) feature provides a comprehensive and flexible networking package that can be configured to satisfy the specific requirements of a customer's network. Prime elements of the NARS feature are:

- simple network access codes
- a uniform dialing plan (UDP)
- a Flexible Numbering Plan (FNP)
- dialing transparency
- automatic least-cost routing
- Time-of-Day (TOD) routing
- flexible ESN "0" routing
- automatic on-network (on-net) to off-network (off-net) overflow
- network controls through Network Class of Service (NCOS) and Facility Restriction Levels (FRL)
- 1–10 digit translation, restriction, recognition (X11 release 5 and later),
- Free Calling Area Screening (FCAS)
- Expensive Route Warning Tone (ERWT)
- NARS bypass control
- Network speed call
- Network Call Transfer (NXFER)
- 1+ Dialing

Table 2 lists the minimum and maximum parameter settings for the various networking elements.

Table 2
Networking feature parameters

Parameter	Features equipped at switch		
	CDP	BARS	NARS
NCOS groups	0–99 (0–3)	0–99 (0–7)	0–99 (0–15)
Facility Restriction Levels	0–7	0–7	0–7
Digit manipulation tables	1–31	1–255	1–255 [1–999]
Route list blocks	0–31	0–127	0–255 [0–999]
Route list block entries	0–6 (0–2)	0–63 {0–31} (0–7)	0–63 {0–31} (0–7)
FCAS tables		1–127	1–255
FSNS tables			[1–255]
SDR blocks			
X11 release 5 and later		256	512
X11 release 4 and earlier		32	256
Legend: NCOS = Network Class of Service FCAS = Free Calling Area Screening FSNS = Free Special Number Screening SDR = Supplemental Digit Restriction Values in parenthesis () are for releases prior to X11 release 13. Values in braces {} are for releases prior to X11 release 15. Values in brackets [] apply if the Flexible Numbering Plan (FNP) package (160) is equipped.			

Note 1: If the New Flexible Code Restriction (NFCR) feature (see *X11 features and services* [553-3001-305] or *X11 features and services Reference Guide* [553-3001-306]) is equipped in conjunction with either BARS and/or CDP, the number of available NCOS groups is 8.

Note 2: If the Coordinated Dialing Plan (CDP), Basic Alternate Route Selection (BARS), and Network Alternate Route Selection (NARS) features are equipped in the same switch but for different customers, the

highest parameter values apply to that switch; for example, if one customer has CDP, another customer has NARS and another customer has BARS, the NARS parameters apply to the all customers.

NARS access codes

To access NARS, the user at an ESN node, ESN main, or Conventional main dials either one of two customer-assigned network Access Codes, AC1 or AC2. These access codes are typically “8” for on-net and long distance calls (AC1), and “9” for off-net and local calls (AC2). However, any one-digit or two-digit code can be used if the Flexible Numbering Plan (FNP) package (160) is not equipped or any one-digit to four-digit code can be used if FNP package (160) is equipped, provided the access code assigned for AC1 is different from that assigned for AC2, and there is no conflict with any other part of the dialing plan.

Note: Only tie trunks allow digit insertion on the AC1 code. DISA (CO) trunks require the user to dial the AC1 code.

Dialing a NARS access code triggers NARS to perform the necessary call processing and routing using a specified set of network translation tables. This mechanism is used to implement the UDP for private networks. (NARS dial tone may or may not be provided to the caller after an access code is dialed, at the option of the customer.)

Uniform dialing plan

The UDP enables users at an ESN node, ESN main, or Conventional main to dial all calls in a uniform manner, regardless of the location of the calling party or the route which the call takes.

End-of-dial timing

Prior to X11 release 20, calls that were routed using Basic Alternate Route Selection (BARS) or NARS used a software defined Network Interdigit Timer (NIT) which was set to eight “8” seconds to determine the end-of-dialing. With X11 release 20 and later the NIT is now user definable on a per-customer basis. It is defined by responding to the NIT prompt in LD 15 with a number in the range from two “2” to eight “8”. This value indicates the maximum number of seconds allowed between digits being dialed. If the user does not dial another digit within the time input in response to the NIT prompt, the software considers dialing as being complete.

To achieve shorter call processing times the user may dial an # (octothorpe, pound, number sign) at the end of a dialed digit string. The # informs the software that all required digits have been dialed and that the digits may now be analyzed for call processing purposes. If the user does not use the #, then the system waits for the NIT to expire prior to analyzing the dialed digits.

UDP for on-net calling

An on-net call is one which terminates at a customer-owned location. To reach any on-net location, the user dials the on-net access code (AC1), followed by seven digits. The format for this call would be:

AC1 * LOC + XXXX

Legend:

AC1 = the on-net access code,

***** = pause for NARS dial tone (optional)

LOC = a three-digit location code assigned for the destination location (area code)

XXXX = the extension number of the party to be reached at the destination location

Each switch which is part of the network (including the ESN nodes) is identified by a unique three-digit location (LOC) code assigned at the ESN node. If 1+ Dialing is used, there must be no conflict between the location code number assigned for a switch and all Number Plan Area (NPA) codes.

A customer-owned location can be either physically connected to the network (by means of private trunk facilities) or virtually connected to the network (by means of public facilities). If a location is virtually connected to the network, the dialed LOC code is translated and converted by NARS translation (at the ESN node) into the public number for the virtual location; for example, the Direct Distance Dialing (DDD) number or the Direct Inward Dialing (DID) number.

Example

[Figure 2](#) illustrates an ESN network with a typical UDP. A user at LOC 776 (Conventional main, location I) wishing to call extension number 3283 at LOC 777 (ESN main, location H) would first dial 8 (AC1), pause for the

optional NARS dial tone from ESN node at location G, then dial 777–3283. A user at any other customer location which is part of the network would dial these same numbers to reach extension 3283.

UDP for off-net calling

An off-net call is one which does not terminate at a customer-owned location, even though some on-net facilities may be used to complete a portion of the call routing. Referring to [Figure 2](#), a call would be termed off-net if a user at LOC 776 called a number associated with CO 758–XXXX in the foreign area code 214.

[Table 3](#) lists the dialing formats for the various types of UDP calls.

UDP for switch equipped with directory number expansion

The Directory Number Expansion (DNXP) package allows an internal Directory Number (DN) to have up to seven digits. If the DNXP package is equipped, a seven-digit LOC call to an ESN switch can be terminated to a seven-digit internal DN. This is accomplished by using the Digit Manipulation Index (DMI) for a Home Location Code (HLOC). The HLOC can have an optional DMI which defines digits to be inserted and leading digits to be deleted. The DMI option can be selected and defined in LD 90 (North American X11 users refer to *X11 input/output guide* [553-3001-400]; International X11 users refer to *X11 data administration input/output guide including supplementary features* [Appendix 1 to 553-2311-311]).

A seven-digit LOC call to an ESN switch with five-, six-, or seven-digit internal DNs can be achieved by manipulating its HLOCs—deleting the first three digits and inserting one digit, two digits, or three digits respectively.

Example

An existing ESN switch with LOC 646 and four-digit dialing plan is upgraded to a five-digit dialing plan by prefixing the digit “2”. An incoming on-net (LOC) call can be handled as follows:

- 1** Define a DMI for the HLOC 646 by:
 - Deleting the first 3 digits (for example, 646)
 - Inserting the digit “2”
- 2** The LOC call 646–2359 to a telephone of this switch has become a HLOC call in the switch (with the same digit string). Therefore, it is converted to 22359 and terminated to the desired telephone.

Figure 2
Example of an ESN with a typical Uniform Dialing Plan

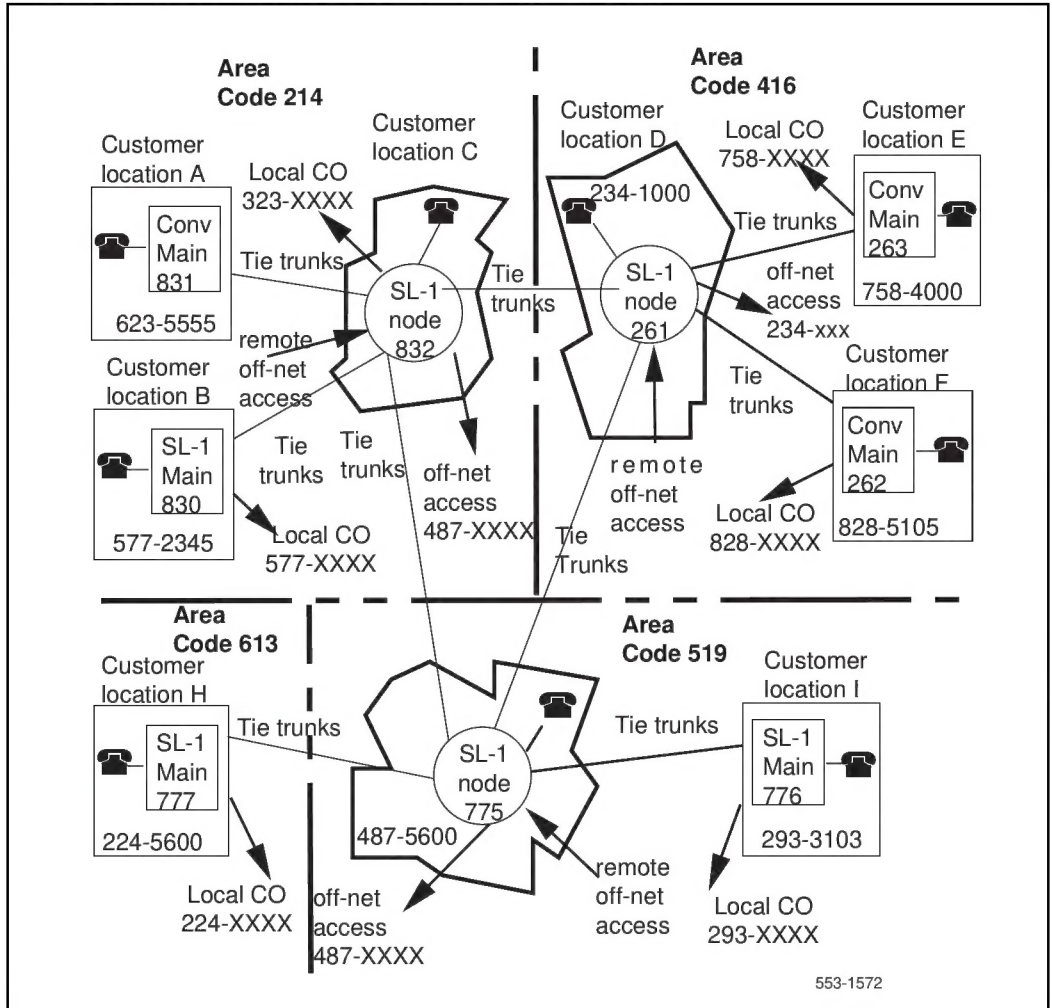


Table 3
Dialing formats for NARS UDP calls (Part 1 of 2)

Call type	Dialing format	Code capacity
On-net (Notes 1, 2 and 3)	AC1 * LOC + XXXX	640
DDD FNPA (Note 1)	AC1 * 1 + NPA + NXX + XXXX	160
Network Speed Call	AC1 * LA + LN	1
Operator-assisted DDD	AC1 * 0 + NPA + NXX + XXXX	160
International DDD	AC1 * 011 + CC + NN	99
Operator-assisted International DDD	AC1 * 01 + CC + NN	99
DDD HNPA (Note 1)	AC2 * 1 + NXX + XXXX	1
DDD operator	AC2 * 0	1
Local calls (Note 1)	AC2 * NXX + XXXX	640
Special local services	AC2 * SPN	8
Toll-free calls	AC2 * 800 + NXX + XXXX	1
Toll-free calls (Note 1)	AC2 * 1 + 800 + NXX + XXXX	1
Toll special numbers	AC2 * 900 + NXX + XXXX	1
Toll special numbers (Note 1)	AC2 * 1 + 900 + NXX + XXXX	1
Note 1: If 1+ Dialing is used, the on-net and Local Calls code capacities are increased to 800 and 792 respectively. Note 2: If the code 1XX is reserved for future 1+ Dialing use, and not for Network Speed Call codes, then the location code capacity will be reduced to 639 if a three-digit NSC code is used, 632 if a two-digit NSC code is used, or 560 if a one-digit NSC code is used. Note 3: When 1+ Dialing is used, Network Speed Call access will be in the form of 2XX–9XX as a subset of the location codes utilized in the UDP. The location code capacity will be reduced to 799 if a three-digit NSC code is used, 792 if a two-digit NSC code is used, or 720 if a one-digit NSC code is used.		

Table 3
Dialing formats for NARS UDP calls (Part 2 of 2)

Legend:	
AC1	Access code for on-net, long distance and Network Speed Calls. Any one or two digit number if FNP (package 160) not equipped. Any one to four digit number if FNP (package 160) equipped.
AC2	Access code for local calls. Typically the digit "9," can be either one digit or two digits in length.
*	Symbol meaning wait for NARS dial tone (optional).
NPA	Numbering Plan Area (NPA) code. Any number of the form NPX for X11 release 19 and earlier or NXX for X11 release 20 and later.
HNPA	Home Numbering Plan Area (HNPA) code. Any number of the form NPX for X11 release 19 and earlier or NXX for X11 release 20 and later.
FNPA	Foreign Numbering Plan Area (FNPA) code. Any number of the form NPX for X11 release 19 and earlier or NXX for X11 release 20 and later.
CC	Country Code. Any one-, two-, or three-digit number.
NN	National Number. Depends on national dialing plan; max 12 digits including Country Code
N	Any of the digits "2" to "9".
P	The digit "0" or "1".
X	Any of the digits "0" to "9".
LA	List access code. Any one-, two-, or three-digit number.
LN	List element number. Any one-, two-, or three-digit number, maximum of 1000 elements per list.
LOC	Three-digit location code for each UDP network location.
NXX	Local Exchange Code.
XXXX	Four-digit directory (extension) number.
SPN	Special numbers: for example, 411, 611, or may be XXXX.

Flexible Numbering Plan

Flexible Numbering Plan (FNP) package 160 was introduced to the International marketplace as part of the X11 with Supplementary Features Group E (Phase 5) release.

FNP accommodates Global Numbering Plan Requirements by modifying the Electronic Switched Network (ESN) dialing plan. The dialing plans are divided into two areas:

- On-net dialing — which deals with all the possible dialing situations required when dialing to a station located within the Local (private) Network
- Off-net dialing — which deals with all the possible dialing situations required when dialing to a station that is not part of the Local Network (typically the Public Numbering Plan)

FNP was enhanced in the Group F (Phase 6Biv) release to include the ability of inhibiting the time out handling process for ESN Basic Alternate Route Selection (BARS) and Network Alternate Route Selection (NARS) Special Numbers (SPN) and Coordinated Dialing Plan (CDP) Trunk Steering Codes (TSC). The enhancement ensures that all digits are collected prior to seizing a trunk. This enhancement meets Chinese requirements.

Network Alternate Route Selection (NARS) package 58 is a prerequisite for FNP.

With X11 Release 20 FNP is introduced to the Global marketplace.

FNP interacts with both NARS and Coordinated Dialing Plan (CDP) to introduce:

- Universal Numbering Plan (UNP)
- Transferrable Directory Numbers (TNDN)
- Group Dialling Plan (GDP)
- Arbitrary length DN's on a node
- Free Special Number Screening (FSNS)

For further information about FNP refer to the Flexible Numbering Plan chapter in this document, and *Flexible Numbering Plan Description, operation, and administration* (553-2751-105).

Dialing transparency

Extending the UDP to a remote-access switch (ESN main or Conventional main) is accomplished by forming a single tie trunk access group between the remote switch and the ESN node. Users at this remote switch access the trunk group to the node by dialing the on-net access code (AC1). The ESN node is arranged to insert the digit for AC1 on each incoming call from the switch automatically, this allows access for on-net and long distance calling in a transparent fashion. Local calling is arranged through conventional dial “9” CO trunks at the remote access switch.

Note: If an ESN node replaces a tandem switch in a Tandem Tie Trunk Network (TTTN), other tandem switches in the network can “tandem through” the ESN node using the same access codes as before. This requires that there are not any dialing conflicts between the access codes for the TTTN trunks and the dialing plan implemented at the ESN node.

Automatic least-cost routing

For each “on-net” or “off-net” call translated at an ESN node, NARS selects a route from a list of up to eight outgoing alternate routes to complete the call. A list of alternate routes to a particular destination is called a route list, and each route specified in the list is called an entry. Any combination of trunks, for example, Central Office (CO), Foreign Exchange (FX), or TIE, can be specified in a route list.

Note: With X11 release 13 and 14, NARS can select from a list of up to 32 outgoing alternate routes. With X11 release 15 and later, NARS can select from a list of up to 64 outgoing alternate routes

Note: Using the Meridian Bandwidth Controller (DCA System 9000) improves the capacity of T1 based tandem networks. Its dynamic alternate routing capability can independently choose the optimum path for a voice or data call. However, it will be necessary to coordinate the Meridian Bandwidth Controller routing lists with the ESN routing lists.

Typically, the first entries (routes) in a route list are the least-cost routes to a destination and comprise the initial set (I set) of routes in the list. The remaining routes in the list (if any) are the more expensive routes to a destination and they are the extended set of routes in the list. An initial set marker, defined through service change, determines which routes comprise the initial route set. Refer to the CBQ and OHQ sections for more information on I set and extended set routes.

Associated with each entry in a route list is information relevant to:

- the route number (0–511)
- the minimum FRL required for access
- the time of day the route can be accessed
- whether or not queuing (CBQ or OHQ) is allowed on the route
- whether or not the route is to receive expensive route warning tone treatment
- a digit manipulation table index number, (0–255) if the Flexible Numbering Plan (FNP) package is not equipped, (0–999) if the FNP is equipped
- a FCAS table index number (0–255)
- a FSNS table index number (0–255) if FNP package (160) is equipped
- information for conversion from an on-net call to an off-net call

Route eligibility

NARS translates a dialed LOC, NPA, NXX, or SPN (special number) into a route list and searches the list sequentially for an available route. Route eligibility for a given call is based on the caller's NCOS, the NCOS-defined FRL, the current TOD, and COS.

Because each entry in a route list has a minimum FRL required for access and all network users are assigned an FRL through their NCOS, the network communications manager can restrict the type of calls allowed to users.

Example

If the minimum FRL for all calls is 1, except for special local services numbers which are assigned an FRL of 0, a user assigned to an NCOS group with an FRL of 0 would only be able to make calls to the special numbers. In addition, the communications manager can restrict using high-cost facilities by assigning a high FRL to the expensive routes in a route list and a lower FRL to a user's NCOS.

Digit manipulation

Any trunk type can be specified in a route list. However, when certain trunk types are accessed, the digits dialed by the user must be manipulated to conform to the dialing requirements of the trunk. To do this, NARS uses digit manipulation tables to modify the dialed digits.

There can be a maximum of 1000, when Flexible Numbering Plan (FNP) Package (160) is equipped, or 256, if FNP is not equipped, digit manipulation tables. Each table is referenced by a digit manipulation index number and defined at each ESN node as shown in [Figure 3](#). Digit manipulation can delete up to 15 leading digits and insert up to 20 leading digits.

Example

See [Figure 2](#) for an example of an ESN with a typical Uniform Dialing Plan. A user at Conventional main Location I dials the number 8-613-596-9084 to reach an off-net station in the 613 NPA associated with ESN main, Location H.

At the ESN node, NARS selects the appropriate route list for call completion to NPA 613 and finds that the only available route to that NPA is a local CO trunk which requires the insertion of the leading digit “1” for long distance calls. The route list entry for this route specifies a digit manipulation index number (0–999 if Flexible Numbering Plan [FNP] package [160] equipped, 0–255 if FNP not equipped; “0” means no digit manipulation is required). NARS references the digit manipulation table indicated by the index number, deletes digits as specified in the table (none in this case), inserts the required digits (“1” in this case) and completes the call on this route.

Time-of-day routing

NARS provides for up to eight (0–7) TOD schedules. Each entry (route) in a route list is assigned to the TOD schedule which specifies the hour(s) that the particular entry can be accessed. Thus, based on the current time of day, the most cost-effective route alternatives can be specified. A typical TOD schedule is shown in [Table 4](#). A TOD schedule can be associated with any number of arbitrarily selected 15-minute periods. However, any one 15 minute period can appear only in one TOD schedule.

Based on the TOD schedule in [Table 4](#), a route list entry assigned to TOD schedule 2 is accessed only between the hours of 00:00 to 07:44 and 17:30 to 23:59. Access to the route at any other time is denied. TOD schedules can be turned “on” or “off” through service change as the traffic conditions change. A TOD schedule is turned on for an entry by turning off all other TOD.

Table 4
A typical TOD schedule

TOD schedule	Time period
2	00:00 to 07:44 17:30 to 23:59
1	07:45 to 08:59 12:00 to 13:14 16:00 to 17:29
0	09:00 to 11:59 13:15 to 15:59

Flexible ESN “0” Routing

Flexible ESN “0” Routing (an X11 release 16 feature) allows routing of calls on different routes based on a few predefined non-left wise unique dialing sequences. Non-left wise unique means that each entry in the table cannot match the leftmost portion of any other entry in the table. For example, if “123” is an entry in the table, then no other entry may begin with “123.”

The ESN translation table will allow any or all of the following non-left wise unique numbers (along with their associated route list) to be entered into the ESN translation table:

- 0
- 00
- 01
- 011

Flexible ESN “0” Routing is part of the existing BARS (57) and NARS (58) packages and has no interaction with other features besides these. Since NARS has two translation tables, two Flexible ESN “0” Routing data blocks will be included in NARS. This means that a call could be configured to route in two different ways.

Flexible ESN “0” Routing is applicable to all route types and network types that are supported by ESN. For information on the appropriate prompts and responses in service change (LD 90), refer to the *X11 input/output guide*.

Automatic on-net to off-net overflow

If all on-net facilities to a location are busy or blocked, NARS can convert a dialed UDP number to the Listed Directory Number (LDN) or DID number of the destination location and use off-net facilities to complete the call. This process is called conversion and this feature is activated on each route list entry where required.

After dialing AC1 + LOC, if an incomplete DN (or no DN at all) is dialed, LDN is outpulsed on routes with conversion (CNV) set to YES. This works because enough digits have been dialed to determine the destination node.

Example

A user at Conventional main Location I ([Table 4](#)) dials 8-777-3283 to reach a party with extension number 3283 at ESN main Location H. At the ESN node, NARS translates the dialed LOC number (777) into a route list, and searches all eligible routes in the list. Failing to find an available tie trunk route, NARS then seizes local off-net facilities and, to complete the call, outpulses either:

- 224-3283, if Location H is arranged for DID
- 224-5600, if Location H is not arranged for DID

Requirements

- Only one LDN may be defined per location code (LOC)
- DID numbers must have the same NXX as the LDN
- Only one contiguous DID DN range can be defined per location. DNs which lie outside the range are converted to the LDN

Multiple DID office code screening (X11 Release 5+)

Multiple DID office code screening is an enhancement to the on-net to Off-net Overflow capability of the NARS feature. This enhancement permits on-net calls which are routed through the public network using on-net to off-net conversion to terminate at any DN which has been defined in the Location Code data block of memory.

For each LOC defined, Multiple DID Office Code Screening allows:

- the definition of multiple NXX codes
- the definition of multiple DN ranges within each NXX

The following arrangements of multiple office codes (NXX) and multiple DN ranges are possible:

- single office code with a single DN range (the only alternative prior to X11 Release 5)
- single office code with multiple DN ranges
- multiple office codes, each with a single DN range
- multiple office codes with multiple DN ranges

Requirements

- Only one NPA per LOC code is allowed.
- Ranges defined within a LOC code must be unique. Overlapping or duplication of ranges is not permitted.
- The number of digits in each DID range must be 4.
- A maximum of 20 DID ranges may be defined per location code, regardless of the number of office codes.

Incoming trunk group exclusion (X11 Release 5+)

Incoming Trunk Group Exclusion is an enhancement to the NARS feature which blocks calls from Main users who use the network to reach destinations in the home NPA or other restricted NPAs, NXXs, LOCs and SPNs. When the feature is configured, users cannot use the network to circumvent the restrictions. They are forced to dial off-net instead and become subject to whatever restrictions are imposed at the Main.

Standard call blocking is applied on outgoing calls to specific NPA, NXX, SPN or LOC at the ESN node if the call is from a specific incoming trunk group.

- This prevents loopback routing through the caller's home switch, for example, home NPA, NXX. Calls which should have been made off-net from the caller's home switch are blocked outgoing at the node.
- Main users are prevented from using ESN to make calls to certain NPA, NXX, SPN or LOC that they are restricted from making at the home switch.

Customers define their own sets of restricted trunk routes to specific NPA, NXX, SPN or LOC. There is one Incoming Trunk Group Exclusion Index (maximum 255) for each defined NPA, NXX, SPN or LOC. Each index points to an Incoming Trunk Group Exclusion (ITGE) table. A maximum of 128 restricted routes can be defined in each ITGE table. Incoming Trunk Group Exclusion provides full ten-digit restriction for NPA and SPN codes, seven-digit restriction for NXX codes and LOC codes. The code itself may be restricted.

When an ESN call is received, NARS tests to see if the dialed code is a restricted type (Supplemental Digit Recognition/Restriction). If it is, NARS checks whether or not it has an ITGE restriction and if there is an Incoming Trunk Exclusion Index (ITEI) number (1–255) associated with it. If an ITEI is defined, the appropriate ITGE table corresponding to the dialed code is searched. If the incoming trunk route is a member of the ITGE, the NARS process is terminated and the call is blocked. Otherwise, call processing continues.

Off-net number recognition

Off-net Number Recognition eliminates the need of using two extra CO trunks when a subscriber, using the private network, dials a DID or DDD number that terminates at an ESN Location. Calls are routed directly to the dialed DN (DID calls) or to the LDN (DDD calls), rather than being switched from the terminating ESN switch to the CO and back again.

Off-net Number Recognition parameters for local and remote DDD and DID locations are defined by the customer in the Network Translation tables and Supplemental Digit Recognition/Restriction blocks (SDRR). Recognition of up to 10 digits can be defined.

Table 5
Network translation tables

Call type	Network translation table (number of digits)	SDRR block (number of digits)
NPA	3	1–7
NXX	3	1–4
SPN	4 1–11 when Flexible Number- ing Plan (FNP) package (160) equipped	1–7

Up to 512 SDRR blocks can be defined. Each table can contain up to 64 entries. Off-net numbers are recognized at the last intelligent NARS/BARS switch. Translation of the NPA, NXX or SPN identifies the

method of treatment for the call. If the data type is SDRR and the index is an SDRR table index, supplemental digit recognition/restriction is applied by comparing the dialed digits with the numbers declared in the SDRR block.

- If no match is found in the SDRR, route selection is called, call processing resumes and the call is routed to the CO of the terminating off-net number.
- If a match is found and the number is in the “denied” block, standard call blocking takes place.
- If a match is found and the number is recognized as a terminating number at the local switch (for example, the last intelligent NARS/BARS switch), the call is terminated at DN (DID calls) or at the attendant DN (DDD calls).
- If a match is found and the dialed number is a recognized number terminating at a remote conventional main, route selection is called, the appropriate digit manipulation takes place and the call is routed directly to the conventional main. DID calls terminate at the dialed number and DDD calls terminate at the attendant DN.

Digit translation/ restriction/ recognition

The ESN provides a 1-digit through 11-digit translation/restriction/recognition capability through the use of network translation tables. There are two network translation tables, one associated with each of the network access codes (AC1 and AC2).

Normal translation mechanisms translate the dialed network access code, for example, 8 or 9, determine that the call is to be processed by NARS, and select the appropriate network translation table, see [Table 5](#). The NARS translation determines the method to be used to process the call and applies digit restriction or recognition where required. The result of translation is to invoke either route selection with a specified route list, or standard call blocking. More information on digit recognition can be found under the “Off-Net Number Recognition” section.

The following information is contained in the network translation tables.

Each NPA (area code) translation entry, excluding the Home NPA (HNPA) contains:

- a route list index number (0–255 or 0–999 when Flexible Numbering Plan [FNP] package [160] equipped) which indicates which route list to use in processing a call to this NPA,
- whether or not there are telephone numbers within this NPA to which network calls are to be blocked; for example, denied,
- whether or not there are telephone numbers within this NPA to which network calls are to be blocked because of ITGE restrictions (X11 release 5+),
- whether or not there are numbers under this NPA that are to be recognized as DID or DDD codes to an on-net location (X11 release 5+), and
- a list of up to 64, one- to seven-digit numbers that follow the NPA and are to be blocked or recognized in this NPA.

Each NXX office code translation entry contains:

- a route list index number (0–255 or 0–999 when FNP [package 160] equipped) which indicates which route list to access in processing a call to this NXX,
- whether or not there are telephone numbers within this NXX to which network calls are to be blocked,
- whether or not there are telephone numbers within this NXX to which network calls are to be blocked because of ITGE restrictions,
- whether or not there are numbers under this NXX that are to be recognized as DID or DDD codes to an on-net location, and
- a list of up to 64, one- to four-digit numbers that follow the NXX and are to be blocked or recognized in this NXX.

Each LOC location code translation entry, excluding the Home LOC code contains:

- a route list index number (0–255 or 0–999 when FNP [package 160] equipped) which indicates which route list to access in processing a call to this LOC,

- the Listed Directory Number (LDN) to which the LOC number is to be converted when using off-net DDD facilities,
- the ranges of DID numbers to which the LOC number can be converted when using DID facilities, and
- whether or not there are LOC numbers to which network calls are to be blocked because of ITGE restrictions.

Each SPN (special number) translation entry contains:

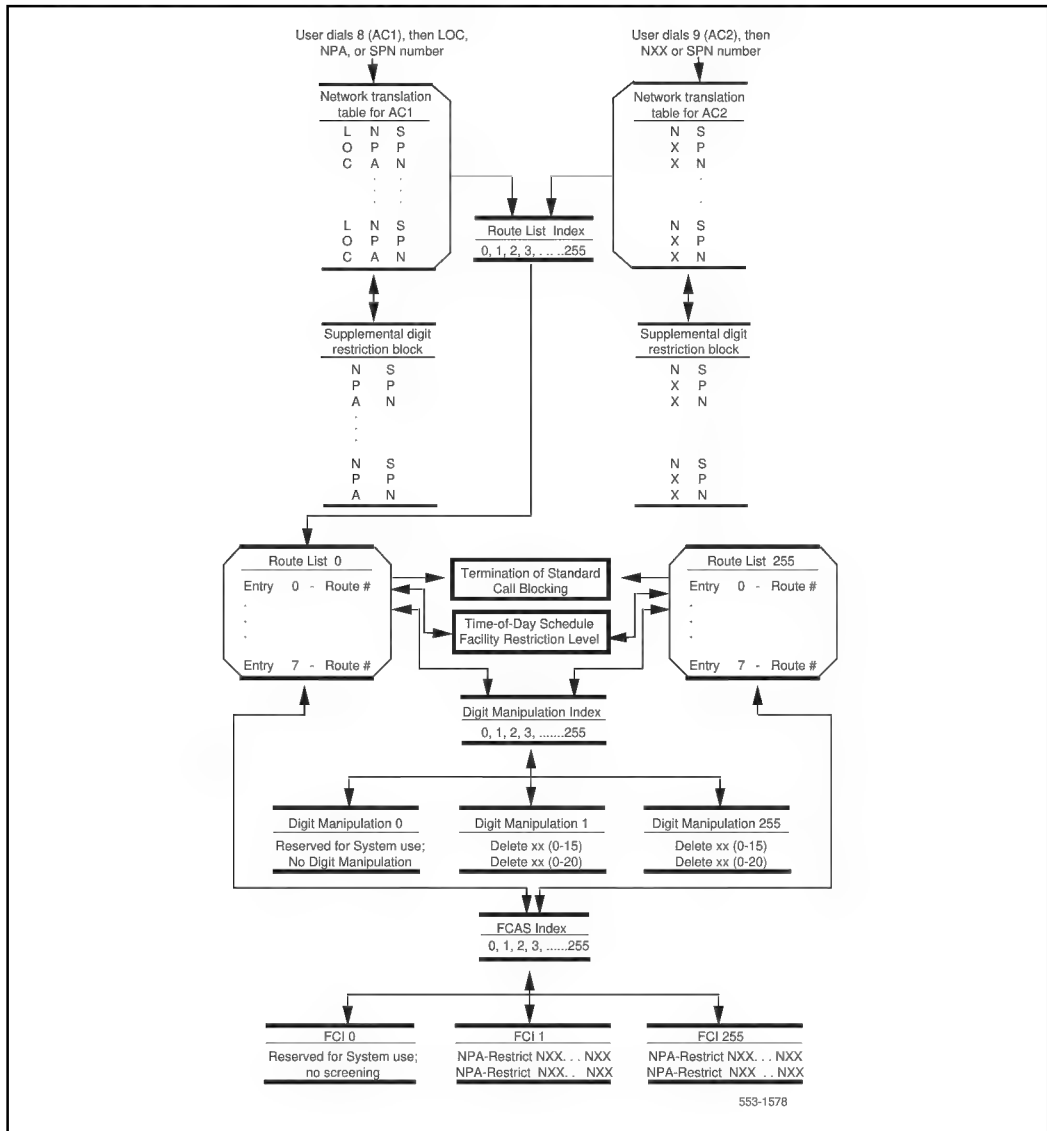
- a route list index number (0–255 or 0–999 when FNP [package 160] equipped) which indicates which route list to access in processing a call to this SPN,
- whether or not there are digits following SPN numbers to which network calls are to be blocked,
- whether or not there are SPN numbers to which network calls are to be blocked because of ITGE restrictions,
- whether or not there are SPN numbers that are to be recognized as codes to an on-net location, and
- a list of up to 64 entries, one of one to seven numbers that are to be blocked or recognized when following the SPN.

Supplemental digit restriction (release dependent)

Supplemental digit restriction blocks, refer to [Table 6](#), function as follows:

- block (deny) access to certain telephone numbers,
- recognize off-net calls dialed to on-net locations, and
- prevent routing of calls to the home switch of the originating trunk group by either on-net or off-net facilities.

Figure 3
NARS elements accessed at an ESN node to process a network call



The customer can also specify through service change the treatment that blocked calls receive. For example, overflow tone, intercept to attendant, or recorded announcement. One block can be assigned per NPA, NXX, or SPN.

Table 6
Supplemental digit restriction blocks per NARS or BARS

Network package	X11 release 4	X11 release 5 and later
ESN node	256	512
BARS	32	256
Note: For X11 release 4 and earlier, one block can recognize or restrict up to 16 numbers. For X11 release 5 and later software, one block can recognize or restrict up to 64 numbers.		

If the Flexible Numbering Plan (FNP) package (160) is equipped, Special Numbers (SPN) may have an Alternate Remote Routing Number assigned in the Supplemental Digit Restriction or Recognition table. For further details refer to *Flexible Numbering Plan Description, operation, and administration* (553-2751-105).

Free Calling Area Screening

Free Calling Area Screening (FCAS) is a NARS feature that provides full six-digit (NPA–NXX) screening to determine the route choice for completion of off-net calls. With FCAS, a customer can allow calls to NXX codes within the “free calling area” surrounding a particular on-net location, and restrict (deny) calls to those NXX codes that would incur long distance charges.

FCAS is implemented in a similar fashion to digit manipulation (through tables). A Meridian 1 ESN node equipped with NARS can accommodate up to 255 FCAS tables. Each table can contain up to 15 NPA codes. Up to 800 NXX codes can be restricted within each NPA code. Each FCAS table is referenced by a Free Calling Index (FCI) number (0–255), where “FCI = 0” is a system default meaning no Free Calling Area Screening is required. The appropriate FCI number is then assigned to the applicable route list entries.

Whenever a route list entry is being evaluated for an off-net call (for example, 8-NPA-NXX-XXXX), NARS checks to see if there is an FCI number (other than “0”) referred to by the entry. If an FCI number other than “0” is defined, the appropriate FCAS table for the dialed NPA is found and used for NXX screening. If the dialed NXX is denied in the table, NARS does not use the route list entry for call completion, but continues to search for another eligible route list entry. If the dialed NXX is not denied in the table, the route list entry is eligible for the call. Calls converted to the LDN of a location are screened only if the NPA is included as part of the LDN. NXXs allowed in an FCI table are the only ones allowed for that route list entry.

Free Special Number Screening

Free Special Number Screening (FSNS) is a NARS feature that provides 1- to 11-digit Special Number screening to determine the route choice for completion of calls when the Flexible Numbering Plan (FNP) package 160 is equipped.

FSNS is implemented in a similar fashion to digit manipulation (through tables). A Meridian 1 ESN node equipped with NARS and FNP can accommodate up to 255 FSNS tables. Each table can contain up to 15 SPN codes. Up to 1000 XXX codes can be restricted within each SPN code. Each FSNS table is referenced by a Free Special Number screening Index (FSNI) number (0–255), where “FSNI = 0” is a system default meaning no Free Special Number Screening is required. The appropriate FSNI number is then assigned to the applicable route list entries.

Whenever a route list entry is being evaluated for a call (for example, 545 192), NARS checks to see if there is an FSNI number (other than “0”) referred to by the entry. If an FSNI number other than “0” is defined, the appropriate FSNS table for the dialed SPN is found and used for XXX screening. If the dialed XXX is denied in the table, NARS does not use the route list entry for call completion, but continues to search for another eligible route list entry. If the dialed XXX is not denied in the table, the route list entry is eligible for the call.

Expensive Route Warning Tone

This feature enables the network manager to select certain users to receive an Expensive Route Warning Tone (ERWT). Eligibility for this tone is based on the user's NCOS. The tone which is three 256 ms bursts of 440 Hz notifies the user that NARS has selected facilities designated as expensive to complete the call. Upon receipt of ERWT, the user has the choice of either allowing the call to complete over the expensive facilities, or going on-hook to avoid the increased expense. The user must make this choice within a programmable time of 0 to 10 seconds. The tones must be activated for the customer group and the expensive route cannot be part of the I set in the route list.

If the call originator is located at an ESN node or ESN main and the Ring Again feature is defined for the user and the user is CBQ(a) eligible, then ring again may be activated to queue the call, see the various queuing features for more information.

If the ESN node is equipped for Call Detail Recording (CDR), acceptance of an expensive route after ERWT is received is noted in the CDR record.

NARS bypass control

A customer can allow selected users to bypass the NARS feature for call completion between any two locations; for example, two locations which share a high community of interest. To do this, routes and trunks are set up between the two locations and assigned an access code distinct from the AC1 and AC2 codes used to access NARS.

The normal trunk controls; for example, Trunk Group Access Restriction (TGAR), class of service, code restriction, are then used to enable access only to the selected users. All other users are denied access to the trunk group and are forced to use NARS for all calls.

Network speed call

The NSC feature enables a user at an ESN node, ESN main, or Conventional main who is normally restricted from making certain types of NARS calls, to make such a call if the destination is a company approved number defined in a System Speed Call (SSC) list. This feature requires that the System Speed Call feature be equipped in addition to Network Speed Call. See *X11*

Features and Services.

Access to the NSC feature is allowed after the NARS access code is dialed. After receiving the NARS dial tone (optional), the user dials a customer-defined Network Speed Call access code of one to three digits. The NSC access code must be unique from all LOC, NPA and NXX codes, and special numbers defined in the translator for the NARS access code.

The NSC access code is associated with a previously defined System Speed Call list (0–4095) through service change in the network translation overlay. If the SSC list has its length (size) changed, the list access code and list number must be deleted and reentered into the NARS translator. An NCOS number is associated with each SSC list. The NCOS assigned to the SSC list is applied to the call only if the FRL (0–7) is greater than that associated with the call originator's assigned NCOS.

Note: Pre X11 release 13, the number of SSC lists was 254 (0–253).

Note: If 1+ Dialing is specified for an NPA, NXX or SPN number in a translator, the digit "1" must not be used as the leading digit for Network Speed Call list codes in that translator.

The user then dials the number of the desired entry in the SSC list. Entry numbers can range from 0 to 9, 00 to 99, or 000 to 999 depending upon the number of elements allocated when the list was defined through service change. After the dialing is finished, the digits defined for the list entry are passed to NARS/BARS translation for processing. Route and feature (OHQ, CBQ) eligibility for call completion are based on the FRL of the NCOS associated with the SSC list only if the FRL of the user's assigned NCOS is lower than that of the list.

Network Call Transfer (NXFER)

This feature improves the operation of the existing Call Transfer (XFER) feature between two switches when a call is transferred back to the originating switch. The regular XFER feature requires two tie trunks to complete the call. With NXFER, and if the call is transferred back to the originating switch by means of a tie trunk of the same trunk group, the originating switch completes the transfer within itself and the tie trunks are dropped. Refer to *ISDN Primary Rate Interface description and administration* (553-2901-100) for a detailed description.

The benefits of the NXFER feature include:

- minimal use of access tie lines,
- improved transmission performance, since tie lines are not used for the completed connection, and
- similar in operation to the existing XFER feature.

Network Call Transfer example

[Figures 4](#) and [5](#) assume that telephone A receives an incoming trunk call from B and transfers it to C. As shown in [Figure 4](#), the NXFER feature allows telephone A at one ESN switch (I) to transfer the tie trunk call from telephone B (switch II) to a third party, telephone C (switch II). NSIG software is needed in addition to NXFER software at both ends of tie trunk. As shown in [Figure 5](#), if the transfer is allowed, stations B and C are connected on switch II and the ESN tie trunks are dropped when the transfer is completed. In comparison, regular Call Transfer (XFER) requires two tie trunks and both switches to connect stations B and C, as shown in [Figure 6](#).

Figure 4
Connection during NXFER

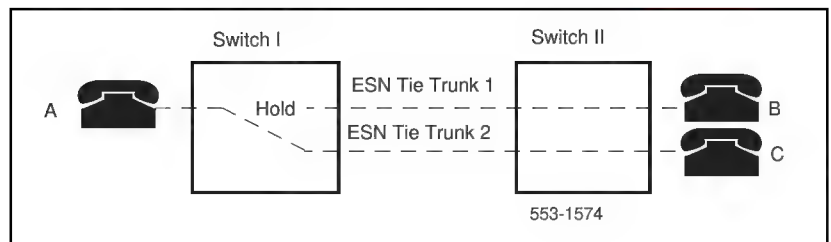


Figure 5
Connection after NXFER

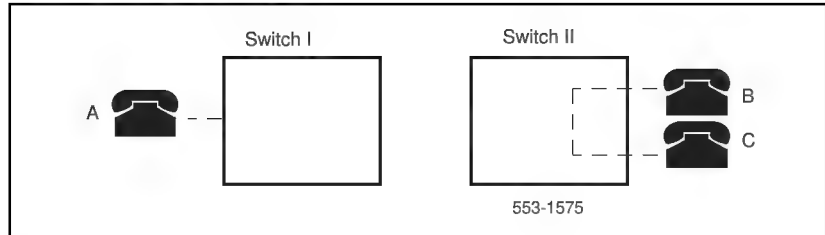
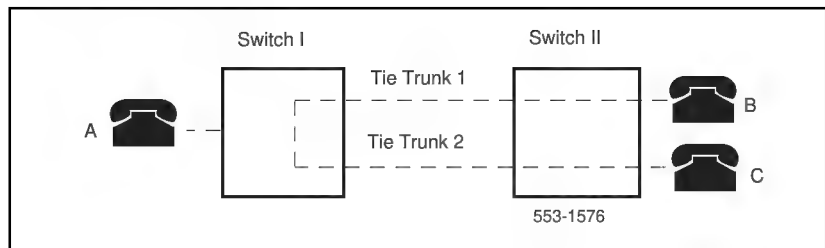


Figure 6
Connection after XFER



1+ Dialing

Translation tables

With 1+ Dialing, both NARS translation tables are equipped for four-digit translation (based on the first one, two, three or four digits), thus allowing NARS customers the option of dialing 1+ after the NARS access code for long distance calls. See [Table 3](#) for dialing formats for NARS Uniform Dialing Plan (UDP) calls.

Code ambiguity

The 1+ Dialing capability also eliminates ambiguity between identical three-digit NPA, NXX and LOC codes so that the NARS customer can route calls to an NPA, NXX or LOC code which conflicts with one of the customer's three-digit codes.

Limitation

If 1+ Dialing is specified for an NPA, NXX or SPN number in a translator, the digit "1" must not be used as the leading digit for Network Speed Call list codes in that translator.

Interchangeable Numbering Plan Area codes impact

Due to the inevitable depletion of available Numbering Plan Area (NPA) codes in North America, the Interchangeable NPA codes plan was developed. This plan modifies the North American Numbering Plan (NANP) by removing the limitation of zero (0) or one (1) being the second digit in the three digit NPA code. By allowing the second digit of area codes to be any number between zero (0) and nine (9) the available NPA codes are increased from 160 to 800; but due to the fact that eight NPA codes are reserved for special purposes the actual increase is from 152 to 792. Interchangeable NPA codes are effective as of July 1, 1995. Table 7 shows the NANP dialing formats with and without Interchangeable NPA codes.

Table 7
NANP dialing formats with and without Interchangeable NPA codes

Dialing format with Interchangeable NPA codes	Call type
[0/1] + NXX + NXX + XXXX	10 digit public number (NPA)
[0/1] + NXX + XXXX	7 digit public number (NXX)
NXX + XXXX	7 digit private number (LOC)
Dialing format without Interchangeable NPA codes	Call type
[0/1] + NPX + NXX + XXXX	10 digit public number (NPA)
[0/1] + NXX + XXXX	7 digit public number (NXX)
NXX + XXXX	7 digit private number (LOC)
Legend:	
[0/1]	Optional digits: 0 indicates operator assisted call. 1 indicates Direct Distance Dial (DDD) call.
N	Digits 2 to 9.
P	Digits 0 or 1.
X	Digits 0 to 9.

Home Number Plan Area (HNPA) codes and NPAs using the NPX format only are allowed in X11 release 19 and earlier, while HNPA's and NPAs using both NPX and NXX formats are allowed in X11 release 20 and later.

Due to the fact that the NPA codes now use the NXX format in North America, dialing plan conflicts are inevitable. Bellcore recommends the use of 1+ Dialing. Under the recommended 1+ Dialing method all ten digit calls are preceded by the digit "1" while no seven digit calls are preceded by the digit "1". Table 8 shows the Bellcore recommended 1+ Dialing format:

Table 8
Bellcore recommended 1+ Dialing format

Dialing format	Call type
[0] + 1 + NXX + NXX + XXXX	10 digit public number (NPA)
[0] + NXX + XXXX	7 digit public number (NXX)
NXX + XXXX	7 digit private number (LOC)
Legend: [0] Optional: indicates operator assisted call 1 Indicates 10 digit public number to follow (NPA). N Digits 2 to 9. X Digits 0 to 9.	

Refer to *Basic and Network Alternate Route Selection description* (553-2751-100) for recommended implementation information.

System administrators must also be aware of the fact that the North American Toll Denied (TLD) class of service restriction will no longer bar all toll calls with Interchangeable NPA codes due to the fact that the TLD class of service restriction only checks to see if the second digit of an NPA is "0" or "1". Similarly, the North American toll CDR option will also cease to function accurately.

If toll calls are to be restricted with Interchangeable NPA codes the system administrator must use either the Code Restriction or the New Flexible Code Restriction feature for calls that are not routed by BARS or NARS. BARS and NARS will still be able to reliably identify toll calls.

Federal Communication Commission Equal Access Carrier Access Code Expansion impact

In May 1991, the Federal Communications Commission (FCC) mandated that Call Aggregators (CA) allow customers *Equal Access* to interexchange carriers. This capability is available with X11 release 17 and later. This allows callers to use interexchange carriers regardless of the CA's prescribed carrier. As a concession to CA's the FCC has allowed the optional restriction of direct dialed Equal Access toll calls.

Any call preceded by a Carrier Access Code (CAC) is considered to be an Equal Access call. The CAC consists of an Equal Access identifier and a Carrier Identification Code (CIC) which identifies the desired interexchange carrier for a given call. The FCC Equal Access CAC Expansion allows the Equal Access identifier to be expanded from two to three digits, and the CIC to be expanded from three to four digits. Table 9 gives examples of both the original and expanded CAC formats:

Table 9
Original and expanded CAC formats

CAC formats	Equal Access Identifier	Carrier Identification Code
Original	10	XXX
Expanded	101	XXXX

The expanded format is effective as of the first quarter 1995, both formats, original and expanded, will be allowed to coexist for approximately 18 months at which time the original format will be discontinued (fourth quarter 1996).

Along with the introduction of the expanded CAC the FCC Equal Access CAC Expansion feature also eliminates the Selective Carrier Restriction method capabilities, while retaining the General Carrier Restriction capabilities. This results in a single restriction method which will be referred to as Equal Access toll call restriction.

Dialing Plan considerations

To assist Network Dial Plan Administrators in planning for the CAC expansion the following tables show the formats supported and the time frames they are supported in:

Table 10
CAC formats supported until December 31, 1994

Operator-assisted dialing to North American and International locations: 10CIC + 0 10CIC + 0 + NPA + NXX + XXXX 10CIC + 0 + NXX + XXXX 10CIC + 0 + SAC + NXX + XXXX 10CIC + 01 + CC + NN
Direct Distance Dial (DDD) dialing to North American and International locations: 10CIC + 1 + NPA + NXX + XXXX 10CIC + 1 + NXX + XXXX 10CIC + 011 + CC + NN
Where: CIC may be any of the following, 000 to 099, 110 to 149, and 170 to 199. 100 to 109 and 150 to 169 are reserved.

Table 11
CAC formats supported from January 1, 1995 to May 31, 1996

Operator-assisted dialing to North American and International locations: 10CIC + 0 10CIC + 0 + NPA + NXX + XXXX 10CIC + 0 + NXX + XXXX 10CIC + 0 + SAC + NXX + XXXX 10CIC + 01 + CC + NN 101ECIC + 0 101ECIC + 0 + NPA + NXX + XXXX 101ECIC + 0 + NXX + XXXX 101ECIC + 0 + SAC + NXX + XXXX 101ECIC + 01 + CC + NN
Direct Distance Dial (DDD) dialing to North American and International locations: 10CIC + 1 + NPA + NXX + XXXX 10CIC + 1 + NXX + XXXX 10CIC + 011 + CC + NN 101ECIC + 1 + NPA + NXX + XXXX 101ECIC + 1 + NXX + XXXX 101ECIC + 011 + CC + NN
Where: CIC may be any of the following, 000 to 099, 110 to 149, and 170 to 199 and ECIC may be 5000 to 6999.

Table 12
CAC formats supported from June 1, 1996 onward

Operator-assisted dialing to North American and International locations: 101XXXX + 0 101XXXX + 0 + NPA + NXX + XXXX 101XXXX + 0 + NXX + XXXX 101XXXX + 0 + SAC + NXX + XXXX 101XXXX + 01 + CC + NN
Direct Distance Dial (DDD) dialing to North American and International locations: 101XXXX + 1 + NPA + NXX + XXXX 101XXXX + 1 + NXX + XXXX 101XXXX + 011 + CC + NN

During the time when both original and expanded CAC formats are supported it should be noted that the original CICs will be supported by the expanded CAC format if “0” is dialed before the original CIC. Table 13 shows the interactions between CAC formats during the various time frames:

Table 13
CAC format interactions

Supported CAC formats	Dialing sequences	Example
Original only	10XXX + ...	10123 + 1 + NPA + NXX + XXXX
Original and Expanded	10XXX + ... 1010XXX + ...	10123 + 1 + NPA + NXX + XXXX 1010123 + 1 + NPA + NXX + XXXX
Expanded only	1010XXX + ...	1010123 + 1 + NPA + NXX + XXXX

Carrier Access Codes dialing sequences with special characters

The Meridian 1 recognizes two special characters in any dialing sequence. These characters are the * (star or asterisk) and # (number sign, pound, or octothorpe). The *, when detected in a dialing sequence, causes a pause in the outpulsing of digits, while the #, when detected in a dialing sequence, indicates end-of-dialing, i.e., no further digits are required to process the call.

Due to an interaction with Equal Access if the Meridian 1 is configured to restrict international toll calls, then direct dialed Equal Access operator calls (101XXXX + 0) can not be terminated with an #. If the Equal Access operator call is terminated with an # the call will be restricted. Table 14 depicts this interaction:

Table 14
Octothorpe with Equal Access interaction

If	101XXX + 011 + CC + NN	calls are restricted.
Then	101XXX + 0 + #	calls will also be restricted.
But	101XXXX + 0	will not be restricted.

Configuring Equal Access within a Network

Equal Access toll restriction is intended for use on an outgoing route from a Meridian 1 to a Central Office. This feature is not intended for restriction of calls which terminate on a network node. Therefore, network signaling (ESN3, ESN5, or ETN) is not supported.

Within a network Equal Access toll calls should be restricted at the outgoing node (the node which is directly connected to the Central Office). Refer to *Basic and Network Alternate Route Selection description* (553-2751-100) for implementation information.

